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(54) Abstract Title  
Telephone handset unit with a touch-sensitive display screen

(57) A telephone unit 5 including a touchsensitive display screen 3 operable to display images of user operable keys 15, 17 such that when a region of the screen facing one of the key images is touched by the user a telephone function corresponding to that key is operated and wherein the display screen is operable to display the images of the keys in a first region of the display screen and another display image in a second area of the screen, and wherein the unit is operable to provide to a user selectable options of different relative positions of the first and second regions of the display screen. The unit may use a radio frequency transceiver or a modem connected to a landline for communication. The high resolution, LCD, LED or electroluminescent display is capable of displaying text, data, messages, pictures, graphical images, video images, maps, visual images of optical, infra-red (IR) or X-ray photographs and information relating to such images. Ergonomic, thumb-operated or one-handed use is enabled by displaying a keypad in the upper region of the display.

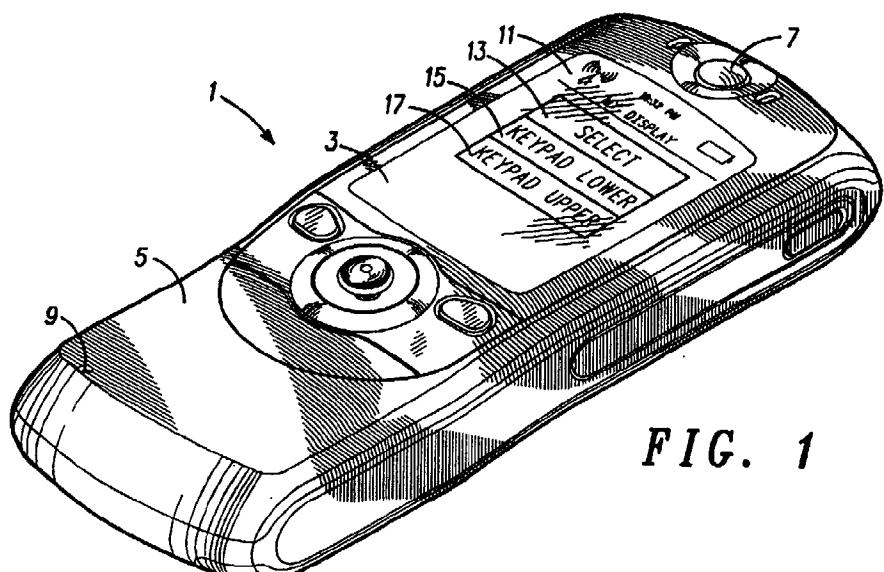
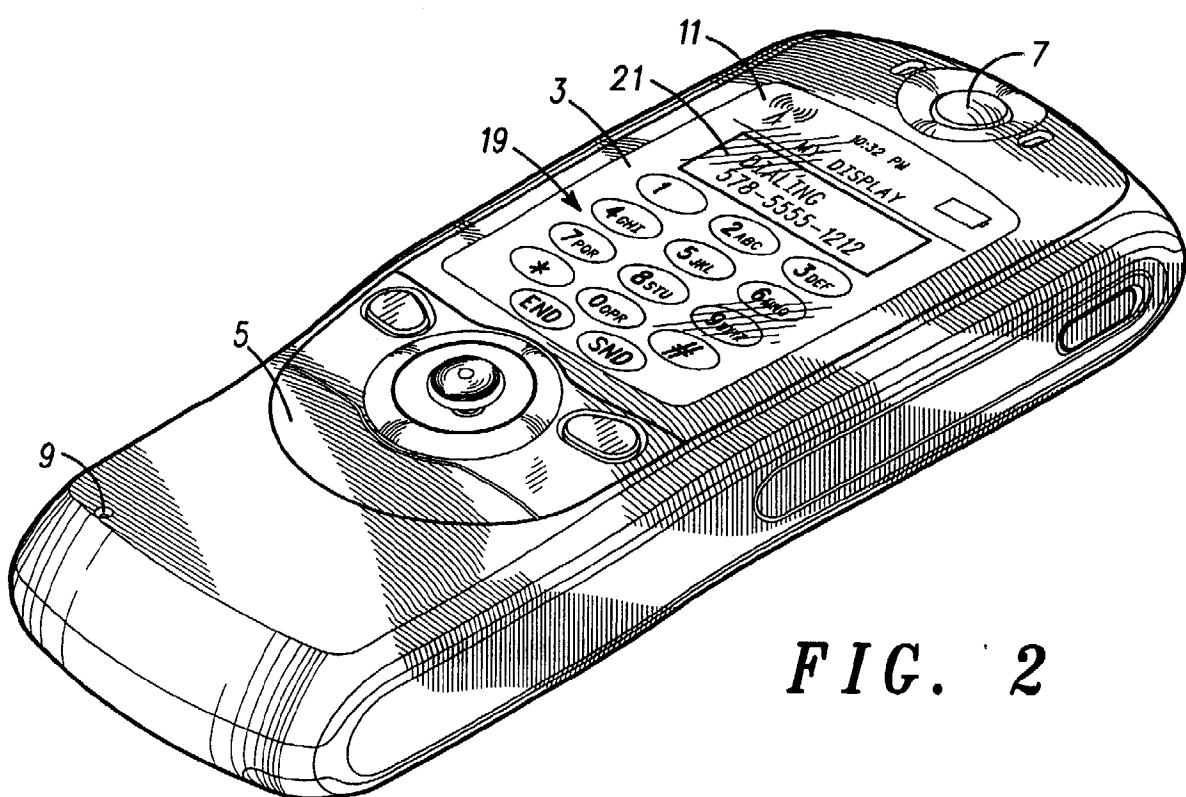
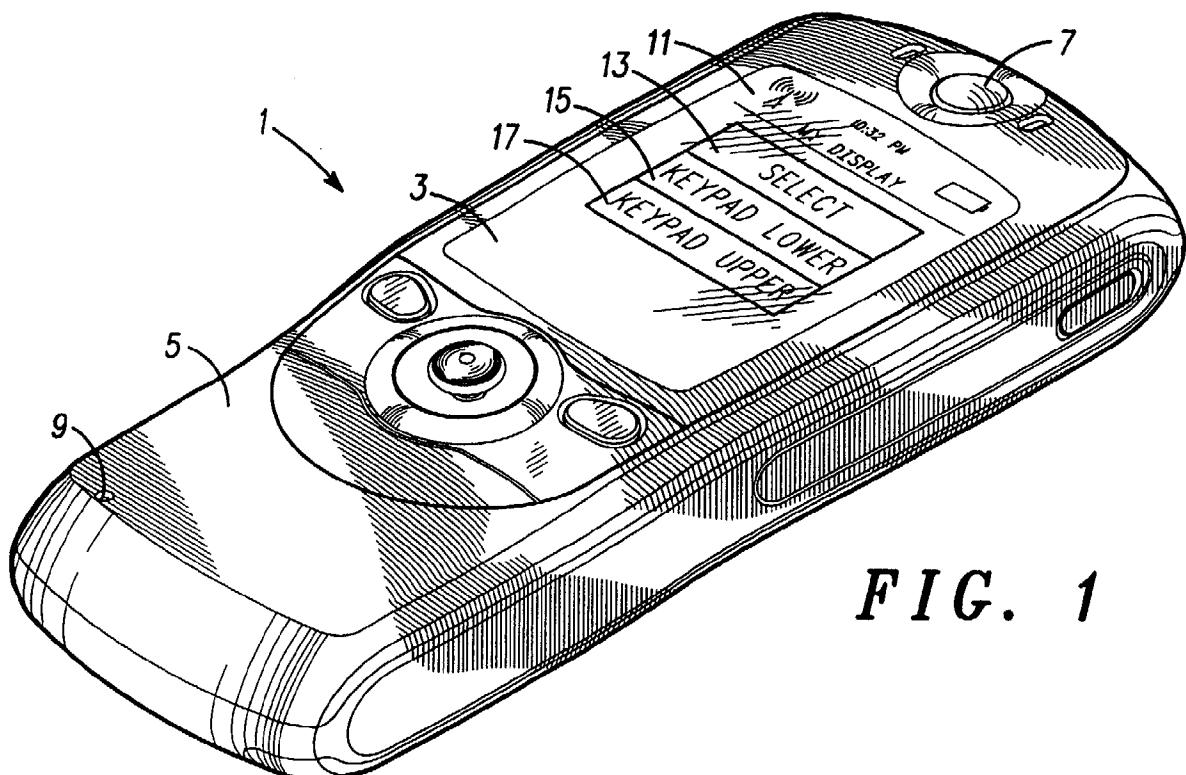


FIG. 1

1/2



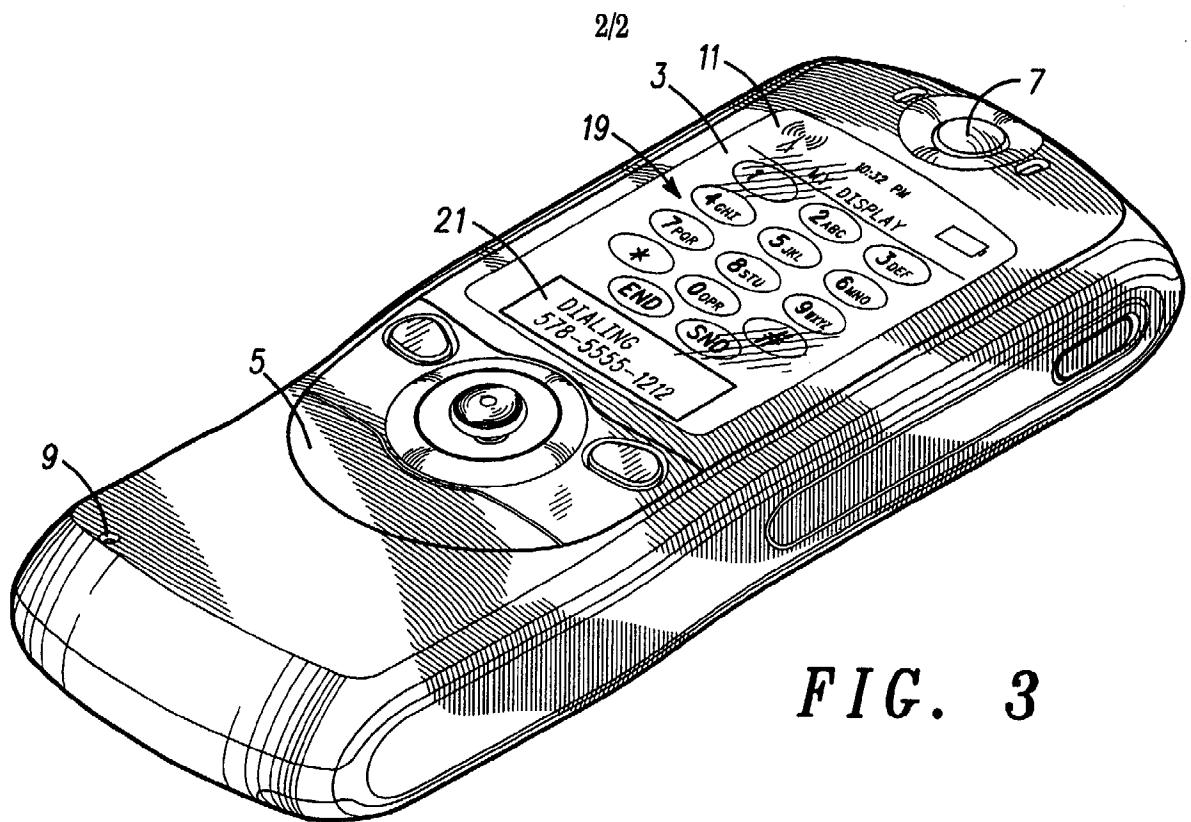


FIG. 3

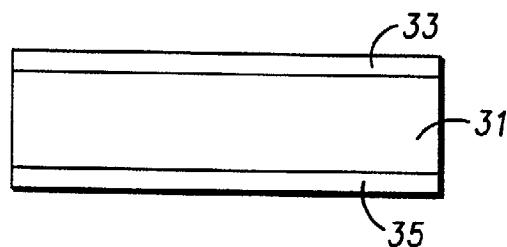
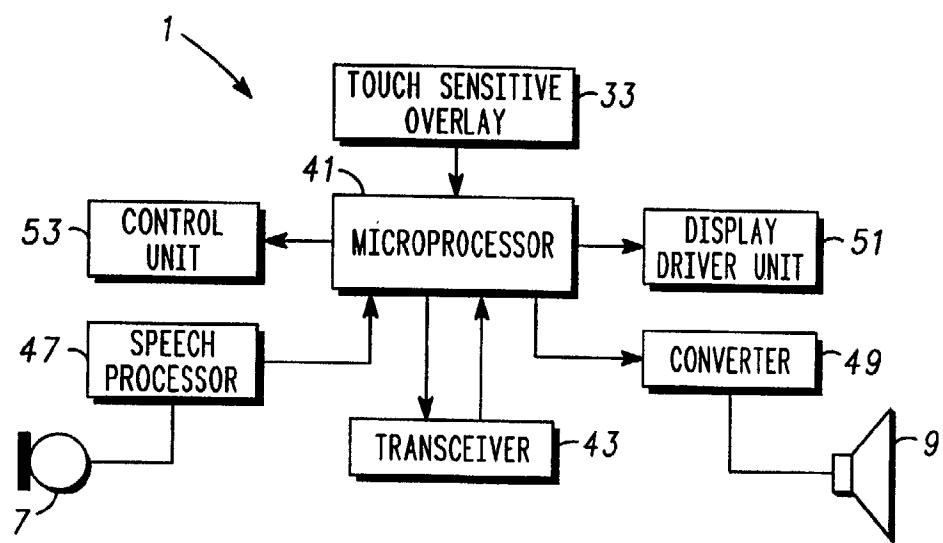


FIG. 5

FIG. 4



## TITLE: TELEPHONE HANDSET UNITS

## FIELD OF THE INVENTION

5 The present invention relates to telephone handset units, in particular units having a touch sensitive display screen.

## BACKGROUND OF THE INVENTION

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Telephone handset units which include a touch sensitive display are becoming available. In such units, a display screen is provided to display useful information in a usual manner. The display is capable of displaying 15 images of keys and the like corresponding to the mechanically operated keys or buttons of a conventional telephone handset keypad, e.g. to select numbers or letters. A touch sensitive overlay covers the displayed images. When a localised region of the overlay adjacent to 20 a displayed key is touched by a user a function corresponding to the displayed key is operated. Such key images are known in the art as 'soft keys'.

Units which include touch sensitive overlays may be produced with few or none of the mechanically operated keys 25 or buttons used on a conventional handset and are therefore simpler and cheaper to manufacture and can be made in a more compact form than conventional handsets.

US-A-6,052,606 describes such a handset of the new type. In this handset, two display areas are provided but 30 the soft keys which represent the keys of a conventional keypad are always provided in a fixed display area which

corresponds in position to the conventional keypad position on a conventional handset.

#### SUMMARY OF THE PRESENT INVENTION

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We have appreciated in connection with the present invention that the conventional position of a keypad, i.e. in a lower region of the face of the handset, is not always an ergonomically satisfactory one. For example, if a user 10 attempts to hold the handset and operate the keys of the keypad with one hand the user has to bend his or her fingers awkwardly to operate the keys.

According to the present invention in a first aspect there is provided a telephone handset unit including a 15 touch sensitive display screen operable to display images of user sensitive keys such that when a region of the screen facing one of the key images is touched by a user a telephone function corresponding to that key is operated and wherein the display screen is operable to display the 20 images of the keys in a first region of the display screen and another display image in a second region of the screen, and wherein the unit is operable to provide to a user selectable options of different relative positions of the first and second regions on the screen.

25 The images of keys displayed by the display screen in the first region may comprise keys representing function keys of a telephone handset, e.g. numeral or letter entry keys and/or control function keys.

30 The other image(s) displayed by the display screen in the second region may comprise other image(s) suitable for display on a handset display. For example, such image(s) may for example comprise one or more of the following;

data, e.g. alphanumeric, characters representing images selected by touching; messages about user options or functions or operational properties or location specifications of the handset unit; stored, sent or

5 received messages comprising text, data, messages, pictures, graphical images, video images, maps, visual images of optical, infra-red or X-ray photographs, and the like; and information relating to such messages or images.

In a first operational option selectable by a user,

10 the first region of the display is below the second region relative to the top of the display screen (i.e. when the display screen is in an upright position and viewed normally by the user). This corresponds to the conventional positional relationship between the keyboard and display on

15 a telephone handset unit such as a mobile telephone handset.

In a second option selectable by the user, the second region of the display is above the first region, i.e. in a positional relationship which is an inverse of the first

20 option. In the second option, the position of the images of the keys in the first display region may be adapted to permit the user when holding the handset unit in the palm of one hand to select images of keys using one or more fingers and/or the thumb of the same hand. Thus by use of

25 the second option, the user is able to hold the unit in one hand, operate keys using the fingers and/or thumb of the same hand and view information on the display in the second display region without using the other hand.

Selection of the first or second option of the

30 relative positions of the first and second display regions by a user may be made by a user via a conventional mechanically operated key or button provided on the unit or

a soft key (i.e. an image of a key) provided on the display. In either case, a prompt message may be displayed by the display of the handset unit indicating the options available to the user. In either case, the handset may

5 include a controller such as a digital signal processor which controls operation of the handset. A signal generated by the user selecting the appropriate button or key (by pressing or touching as appropriate) may be provided to the controller to arrange the display into the selected format.

10 The handset unit according to the present invention may be a mobile or portable telephone handset which is operable to communicate with one or more other units by a radio link, e.g. in a radio communications system operating in a trunked mode or a direct unit to unit communication mode or via a local radio link using a Bluetooth protocol.

15 Alternatively, the handset unit may be connected to a landline telephone system.

The display screen of the handset according to the present invention may be an electro-optical display

20 screen of a known kind. The electro-optical display may comprise a liquid crystal display, an electroluminescent display, a light emitting diode display or any other display of the kinds known in the electro-optical display art, particularly those known for use in handset units, all constructed and operated in a manner known in

25 the art.

A processor included in the handset unit suitably programmed in a known way, may be operable to convert data to be displayed from an electronic form into an output signal which may be used as a corresponding display driver voltage to produce the required display images, including the images of the keys which may be

selected in the first display region. The processor may be part of the same device providing the function of the controller mentioned earlier.

The display screen in the handset according to the 5 present invention may be covered at least in part by a touch sensitive overlay by which a localised region of the overlay, corresponding to a soft key (image of a key) displayed behind the overlay, may be touched or contacted to provide operation of a function corresponding to the 10 displayed key. The touch sensitive overlay may be operable in one of the ways known in the touch display art, for example using capacitance sensing, resistive sensing or acoustic surface waves to detect which position on the overlay has been touched. The touch sensitive overlay may 15 cover both the first and second display regions whereby keys, buttons, option bars and the like displayed in both regions may be selected by a user touching an appropriate region of the overlay.

Embodiments of the present invention will now be 20 described by way of example with reference to the accompanying drawings, in which:

#### **BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS**

25 Figure 1 is a perspective view of a mobile telephone handset operable in accordance with an embodiment of the present invention showing display options which may be selected by a user.

30 Figure 2 is a perspective view of the handset of Figure 1 showing a form of display obtained when a first option shown in Figure 1 has been selected.

Figure 3 is a perspective view of the handset of Figure 1 showing an alternative form of display obtained when a second option shown in Figure 1 is obtained.

Figure 4 is a transverse cross-sectional side view of 5 the display of the handset shown in Figure 1 showing construction of the display.

Figure 5 is a block schematic circuit diagram showing operational circuitry of the handset of Figure 1.

#### 10 DESCRIPTION OF EMBODIMENTS OF THE INVENTION

As shown in Figure 1, a mobile telephone handset 1 for use in a cellular communication system has a display 3 enclosed in a casing 5 which also houses the operational 15 electronic circuit components (not shown in Figure 1 but shown schematically in Figure 5.) of the handset 1. A speaker 7 is provided near the top of the front face of the handset 1 above the display 3. A microphone 9 is also provided near the lower end of the front face below the 20 display 3.

When the handset 1 has been switched on images are displayed in a narrow top region 11 of the display 3. Generally, the images of the region 11 are fixed in position whilst the handset is in operation. A menu 13 is 25 provided on the display 3 giving the user (at least) two options 15,17 regarding the relative position of a keypad to be displayed on the display 3. As shown in Figure 1, the two options displayed 15,17 are respectively 'Keypad lower' and 'Keypad upper'. Either option may be selected by a user 30 by touching the front of the display 3 in a localised region next to the appropriate displayed option.

If the user selects the option 15, 'Keypad lower', the display 3 is arranged as shown in Figure 2, with an area 19 displaying soft keys in an image representing a keypad generally in a position corresponding to the position of a conventional keypad on a conventional handset. As shown in Figure 2, an area 21 of the display 3 above the area 19 but below the top region 11 is used as a display and displays information other than the soft keys, i.e. information of the type which appears on a conventional handset display.

5 For example, in Figure 2, the telephone number which has been dialled is displayed.

10 For example, in Figure 2, the telephone number which has been dialled is displayed.

Alternatively, if the user selects the option 17, 'Keypad upper', the display 3 is arranged as shown in Figure 3. The areas 19 and 21 of the display 3 display the same information as shown in Figure 2 but in this case the areas 19 and 21 are mutually inverted compared with their arrangement shown in Figure 2. The arrangement shown in Figure 3 is more suitable for a user who wishes to hold the handset 1 and select soft keys of the keypad image shown in 15 the display area 19 by touching the front face of the display 3 in a localised region next to the selected soft key.

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Figure 4 shows construction of a display panel which may be used to provide the display 3. The display panel includes an electro-optical display 31 which may be fabricated in a known manner on glass substrates, a touch sensitive overlay 33 provided on the front face of the display panel 31 and a backing 35 provided on the rear face of the display panel 31. The backing 35 provides a suitably 25 light scattering background to the display 3 and may also include an optional backlight, e.g. provided by an electoluminescent layered structure. When a soft key of the

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keypad image shown in the display area 19 in Figure 2 or Figure 3 or any other function (including the arrangement of keyboard position from the options displayed in Figure 1) is selected by a user touching the overlay 33 in a suitable region, an electrical signal is generated which causes the appropriate function represented by the selected key or option to be applied. For example, the selected key may be a number which is part of a telephone number to be dialled by the user.

Figure 5 is a schematic representation of an operational circuit of the handset 1 which further illustrates this operation. A microprocessor 41 controls operations of the various component sub-units of the unit 1. The microprocessor 41 is connected to and provides control of a transceiver 43 and inputs to the transceiver 43 in digital form signals to operate the transceiver 43. A display driver unit 51 is connected to the microprocessor 41 and operates under control of signals from the microprocessor 41 to display images on the display 3 (Figures 1 to 3). A control unit 53 is connected to the microprocessor 41 and operates to produce backlighting of the display 3 by the backing when a control signal from the microprocessor 41 selects such operation.

The touch sensitive overlay 33 (also shown in Figure 4) is electrically connected to the microprocessor 41 so that signals produced when a user touches the overlay 33 are delivered to the microprocessor 41. For example, when one of the options 17, 19 shown in Figure 1 is selected an electrical signal indicating the selected option is provided to the microprocessor 41 which in turn interprets the action required and provides signals to the display driver unit 51 to arrange the display 3 to provide display

of the areas 19 and 21 in the appropriate parts of the display.

Similarly, when a telephone number is dialled by touching appropriate localised regions of the touch 5 sensitive overlay 33, the electrical signals thereby generated are provided to the microprocessor 41. The microprocessor 41 is connected to and provides control of the transceiver 43. The signals are interpreted by the microprocessor 41 and converted by the microprocessor 41 10 into digital signals for use by the transceiver 43 to establish communication with another unit in a known manner.

The microprocessor 41 also inputs to the transceiver 43 in digital form signals representing speech received 15 from the microphone 7 (also shown in Figures 1 to 3) and processed in a speech processor 47. The microprocessor 41 also delivers signals representing received speech signals via a converter 49 to the speaker 9 (also shown in Figures 1 to 3).

**CLAIMS**

1. A telephone handset unit including a touch sensitive display screen operable to display images of user operable keys such that when a region of the screen facing one of the key images is touched by a user a telephone function corresponding to that key is operated and wherein the display screen is operable to display the images of the keys in a first region of the display screen and another display image in a second region of the screen, and wherein the unit is operable to provide to a user selectable options of different relative positions of the first and second regions on the screen.

2. A handset unit according to claim 1 which is operable such that the images of keys displayed by the display screen in the first region comprise keys representing function keys or numeral or letter entry keys.

3. A handset unit according to claim 1 or claim 2 and wherein the handset is operable such that the image displayed by the display screen in the second region comprises one or more of the following: data characters; messages about user options or functions or operational properties or location specifications of the handset unit; stored, sent or received information comprising text, data, messages, pictures, graphical images, video images, maps, visual images of optical, X-ray or infra-red photographs; and the like; and information relating to such images.

4. A handset unit according to claim 1 or claim 2 and wherein in a first operational option selectable by a user, the first region of the display is below the second region relative to the top of the display screen and in a second option selectable by the user, the second region of the

display is above the first region in a positional relationship which is an inverse of the first option.

5. A handset unit according to any one of the preceding claims and wherein in operation when the second 5 option has been selected the first display region is in an upper part of the display when held upright whereby the position of images of the keys in the first display region is adapted to permit the user when holding the handset unit in the palm of one hand to select an image of one or more 10 of the keys using one or more fingers and/or the thumb of the same hand.

6. A handset unit according to any one of the preceding claims and which is operable such that selection of the first or second option of the relative positions of 15 the first and second display regions by a user can be made using a conventional mechanically operated key or button provided on the unit or a soft key provided on the display.

7. A handset unit according to any one of the preceding claims and wherein, in operation, a prompt 20 message is displayed by the display of the handset unit indicating the options available to the user.

8. A handset unit according to any one of the preceding claims and wherein the handset includes a controller which controls operation of the handset display 25 whereby a signal generated by the user selecting an appropriate button or key to select the first or second option is provided to the controller to cause the controller to provide arrangement of the display into the format of the selected option.

30 9. A handset unit according to any one of the preceding claims and wherein the handset unit comprises a

mobile or portable telephone handset which is operable to communicate with one or more other units by a radio link.

10. A handset unit according to any one of claims 1 to 8 and which is connected to a landline telephone system.

5 11. A handset unit according to any one of the preceding claims and wherein the display screen of the handset comprises an electro-optical display screen which comprises a liquid crystal display, an electroluminescent display, or a light emitting diode display.

10 12. A handset unit according to any one of the preceding claims and wherein the display screen is covered at least in part by a touch sensitive overlay by which a localised region of the overlay, corresponding to a soft key when displayed behind the overlay, may be touched to provide operation of a function corresponding to the displayed key

15 13. A handset unit according to any one of the preceding claims and wherein the touch sensitive overlay covers both the first and second display regions whereby 20 keys, buttons, option bars and the like displayed in both regions may be selected by a user touching an appropriate region of the overlay.

20 14. A handset unit according to claim 1 and which is 25 substantially as described herein with reference to the accompanying drawings.



Application No: GB 0201780.4  
Claims searched: 1

13

Examiner: Dr Jan Miasik  
Date of search: 11 July 2002

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): H4L (LEUG, LEUM), H4T (TBLM), H4K (KBHX)

Int Cl (Ed.7): H04M1/247, H04M1/(22, 23)

Other: Online: EPODOC, WPI, JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2329813 A	(Ericsson Inc.): see whole document, particularly abstract	1-3, 6-13
X	GB 2156186 A	(International Standard Electric Corporation): see whole document, particularly figs. 3 & 5	1-3, 7, 8, 10-13
X	JP 110215220	(Hitachi Telecom Technology Co.): see abstract	1, 2, 6-8, 10-13

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.